

Noise Control

SCOPE

This Instruction:

1. Applies to all personnel.
2. With the exception of requirements for reference and termination audiograms, does not apply to personnel defined as deaf in ANSI Standard S3.20-1973 (R1986) (reference (c)).

B. DEFINITIONS

Terms used in this Instruction are defined below.

C. POLICY

It is our policy to protect all personnel from hearing loss resulting from occupational noise exposure through a continuing, effective, and comprehensive hearing conservation program.

D. RESPONSIBILITIES

1. _____ shall:
 - a. Provide policy guidance and coordination on hearing conservation matters.
 - b. Serve as the principal point of contact (POC) with Federal and State regulatory agencies that control occupational exposure to hazardous noise.
2. Employer shall establish and maintain hearing conservation programs to implement this Instruction. Such programs shall encompass the minimum requirements set forth in section E. and shall include provisions to periodically evaluate the effectiveness of their hearing conservation programs.

E. PROCEDURES

1. Written plan: Employer shall prepare a written plan for the implementation of a comprehensive hearing conservation program. Such plans shall address occupational noise exposure, monitoring, audiometric testing requirements, hearing protectors, information and training, recordkeeping, noise

exposure computation, methods for estimating the adequacy of hearing protector attenuation, audiometric measuring instruments, audiometric test rooms, and acoustic calibration of audiometers.

2. Program implementation: Hearing conservation programs shall be implemented, when personnel are exposed to the following:

- a. Steady noise that has an 8-hour time-weighted average (TWA) noise level of 85 A-weighted decibels (dBA) or above. When appropriate, implementation may also be started regardless of the duration of noise exposure to 85 dBA, or greater. Those criteria apply only to energy in the audible range, up to 16,000 Hertz (Hz).
- b. Impulse noise of 140 peak decibels (dBP), or greater.

3. Noise measurements and analysis

- a. Sound pressure levels shall be measured in all potentially noise-hazardous work areas at least once and within 30 days of any change in operations effecting noise levels.
 - b. A TWA noise level shall be established for all employees working in noise-hazardous areas at least once and within 30 days of any change in operations effecting noise levels.
 - c. A current inventory of all noise-hazardous areas and operations shall be maintained to include, minimally, TWAs, names of employees at risk, and the types of control measures used.
 - d. Only qualified employees shall conduct noise surveys.
 - e. Instrumentation used for those surveys must meet or exceed requirements in ANSI Standard S1.4-1983. Those instruments must be calibrated and the calibration checked with an acoustical calibrator, accurate to within plus or minus 1 decibel (dB), before and after each day's measurements and must have been subjected to a complete electro-acoustical calibration no more than 1 year before the survey.
 - f. Minimally, steady noise measurements shall be made using "A" weighting, with the meter response set to "slow."
- (1) When personal noise dosimeters are used for worker exposure measurements, they must integrate all sound levels from 80 dB to 130 dB using a minimum of the OSHA 5 dB exchange rate. Components may use more stringent criteria, i.e. integration of a broader range or exchange rates less than 5 dB.

(2) Area monitoring may be used to determine worker exposure. In circumstances such as high worker

mobility, significant variations in noise levels, or a significant component of impulse noise, representative personal sampling shall be conducted.

g. Worker noise exposure shall be computed, without regard to any attenuation provided by hearing protectors.

h. Impulse noise measurements should be made using calibrated sound level meters that meet or exceed specifications in ANSI Standard S1.4- 1983, have a peak hold circuit and have a rise time not exceeding 35 microseconds and are capable of measuring peak sound pressure levels in excess of 140 db.

i. If sound level meters meeting the requirements, above, are not available, a combination of calibrated instruments having a peak hold circuit and with a rise time not exceeding 35 microseconds and capable of measuring peak sound pressure levels in excess of 140 dB may be used for impulse noise measurements.

4. Safety signs and labels

a. All hazardous noise areas must be clearly identified by signs located at their entrances or boundaries.

b. Each tool or piece of equipment producing hazardous noise shall be conspicuously marked to alert personnel, except when an entire space is designated a hazardous noise area, and the equipment is stationary. Professional judgment and discretion should be exercised when labeling tools and equipment.

c. Signs and decals that describe (verbally or with other visual symbols) the hazard and the protective measures to be taken shall be used to designate hazardous noise areas and equipment; e.g., "DANGER," "Hazardous Noise," "Hearing Protection Required When in Operation."

5. Noise abatement

a. Engineering controls shall be the primary means of reducing or eliminating employee exposure to hazardous noise. All practical design approaches to reduce noise levels below hazardous levels by engineering principles shall be explored. Where engineering controls are undertaken, the design objective will be to reduce steady-state levels to below 85 dBA without regard to time and to reduce impulse noise levels to below 140 dBP.

b. New equipment being considered for purchase shall have the lowest noise emission levels that are technologically and economically feasible and compatible with performance and environmental requirements. The provisions of Section 15 of the "Noise Control Act of 1972", Pub. L. 92-574, (reference (g)) applies.

c. Acoustics shall be included in specifications for all new facilities and substantial modification projects. The objective shall be to ensure, if feasible, a steady-state level of 84 dBA, or less, at all employee

locations during normal operation.

6. Personal hearing Protectors

a. The use of personal hearing protectors to limit noise exposure is considered to be an interim protective measure, while engineering control methods are being explored. Such devices shall constitute a permanent measure, only if engineering controls are not technologically

or operationally feasible.

b. Employer shall issue personal hearing protectors free to all employees who work in designated hazardous noise areas.

c. The hearing protectors provided shall be capable of attenuating worker noise exposure below an 8-hour TWA of 85 dBA. If hearing protectors do not provide sufficient attenuation, administrative control of exposure shall be necessary.

d. Employees shall be free to choose personal hearing protectors from among those available unless medically contraindicated or inappropriate for a particular hazardous noise exposure. Hearing aids and noise muffs with built-in radios that are designed for recreational listening must not be used in place of, or with, approved hearing protectors.

e. Preformed earplugs shall be fitted and issued only under supervision of personnel who have been specifically trained to fit earplugs.

f. Employees shall receive adequate and effective training in care and use of personal hearing protectors.

g. Employees working in or entering designated hazardous shall carry hearing protectors at all times. When noise sources are operating, employees shall wear their hearing-protection devices regardless of exposure time.

h. Employer shall assess the adequacy of hearing protectors when used in very high noise environments or for extended exposure periods.

i. All levels of supervision and management, by personal example and precept, shall enforce the use of hearing protectors. For noncompliance, management shall consider disciplinary

action as a corrective measure against the offender and the supervisor.

7. Education

All employees who routinely work in designated hazardous noise areas shall receive annual training on the following: effects of noise on hearing, the purpose of hearing-protection the advantages, disadvantages, and attenuation of various:

- a. effects of noise on hearing.
- b. the purpose of hearing-protection
- c. the advantages, disadvantages, and attenuation of various hearing protectors
- d. the purpose of audiometric testing
- e. explanation of the test procedures.

Also, they shall be encouraged to use hearing protectors when they are exposed to hazardous noise while not at work.

8. Audiometric testing

- a. All employees routinely exposed to hazardous noise shall be placed in a hearing testing program. That program shall include pre-placement, periodic (at least once, annually), and termination audiograms. Employees who infrequently or incidentally enter designated

hazardous noise areas need not participate in the audiometric testing program.

- b. All audiometric testing shall:

(1) Be performed by a licensed or certified audiologist, otolaryngologist, or other physician; or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation . A technician who performs audiometric tests shall be responsible to an audiologist, an otolaryngologist, or a physician.

(2) Transpire in a testing environment with background octave band pressure levels not greater than the following:

500 Hz 1000 Hz 2000 Hz 4000 Hz 8000 Hz

30 dB 30 dB 47 dB 57 dB 62 dB

The test environment shall be resurveyed annually using equipment conforming at least to the Type 2 requirements of ANSI Standard S1.4-1983 and the Order II requirements of ANSI Standard S1.11-1986 (references (f) and (i)).

(3) Include pure tone, air conduction, hearing threshold examinations of each ear at the test frequencies of at least 500, 1000, 2000, 3000, 4000, and 6000 Hz.

(4) Be accomplished with audiometers that meet the specifications of ANSI Standard S3.6-1989 (reference (j)).

(5) Occur on audiometers calibrated per specifications in reference (j).

c. Every effort should be made to conduct a reference audiogram on workers before they are assigned to duties involving hazardous noise exposure. In no case shall a reference audiogram be conducted more than 1 month from the date of a worker's initial exposure to hazardous noise.

Regardless of the time of initiation, the first valid hearing test administered is the reference audiogram and shall be preceded by at least 14 hours without exposure to workplace noise. The worker shall be cautioned to avoid high levels of nonoccupational noise exposure during a 14-hour period preceding the examination.

d. Employees who continue to work in designated hazardous noise areas shall receive annual audiograms.

e. Termination audiogram shall be conducted on each worker about to stop working in designated hazardous noise areas. Employees moving to other jobs involving hazardous noise exposure need not be given a termination audiogram.

f. Follow up audiograms shall be conducted when an individual's audiogram shows a threshold shift relative to the original or revised reference audiogram of an average of 10 dB, or more, at 2000, 3000, and 4000 Hz in either ear. The National Institute for Occupational Safety

and Health (NIOSH) age corrections may be applied in cases of positive threshold shift (29 CFR 1910.95) (reference (k)). Medical evaluation is required to validate the existence of a permanent noise-induced threshold shift and shall be done by an audiologist, otolaryngologist, or physician. Any determination that the noise-induced threshold shift is not work-related or has not been aggravated by occupational noise exposure shall be made by a physician .

g. If the threshold shift is confirmed as permanent, the individual shall be notified in writing within 21

days of such determination, and the condition entered in the individual's medical record.

The individual shall be refitted with hearing protection, instructed in its care and use, and strongly encouraged to wear the hearing protection.

h. A new reference audiogram shall replace the original reference audiogram, when the medical evaluation confirms the threshold shift noted during the annual audiogram is permanent. The original reference audiogram shall be retained in the patient's medical record. A revised reference audiogram should also be established, when the hearing threshold demonstrated in the annual audiogram indicates significant improvement over the existing reference audiogram.

9. Personnel assignments

a. Employer may require personnel under consideration for entry-level employment, in an occupational specialty that involves routine exposure to hazardous noise, to meet minimum preselection hearing-level criteria. The employer may develop minimum preselection hearing-level criteria and designate applicable occupational specialties.

b. The employer may establish criteria for permanently excluding personnel with a substantial hearing loss from working in hazardous noise environments. Any exclusion criteria must be applied judiciously to ensure that qualified, trained personnel are not indiscriminately excluded from their career field. Excluding a worker from a career field should be the last resort after repeated attempts to protect the individual's hearing have failed.

10. Access to information, training material, and records

a. Employer shall make available to personnel copies of the Hearing Conservation Program. In addition, the Occupational Health and Safety Administration

(OSHA) standard (29 CFR 1910.95) (reference (k)), shall be posted in all industrial noise-hazardous areas.

b. On request, the employer shall provide affected employees with any information type materials on the hearing conservation program that are supplied by the Assistant Secretary of Labor for Occupational Safety and Health.

c. On request, the employer shall provide personnel, former personnel and representatives designated in writing by the individual employee, with copies of all records pertaining to the audiometric testing and noise exposure to the specific worker.

d. On request, the employer shall provide representatives of the Assistant Secretary of Labor for Occupational Safety and Health with all records pertaining to the companies hearing conservation program.

11. Records

a. All audiometric testing data shall be maintained for the duration of employment plus 30 years.

b. Results of hearing tests performed for hearing conservation, as well as exposure documentation, shall be a permanent part of an individual's health record.

c. Noise exposure data shall be kept for a minimum of 30 years and recorded or in the equivalent format of automated measurement equipment or health hazard inventory system that contains at least the mandatory data elements.

d. All personnel who routinely work in designated hazardous noise areas shall be identified, and a current roster maintained.

12. EFFECTIVE DATE AND IMPLEMENTATION

This Instruction is effective immediately. Forward one copy of implementing instructions to each department.

REFERENCES;

DoD Instruction 6055.1, "DoD Occupational Safety and Health Program," October 26, 1984

American National Standards Institute (ANSI) Standard S1.4-1983, "Specifications for Sound Level Meters," June 25, 1985.

Public Law 92-574, "Noise Control Act of 1972," October 1972

MIL-STD-882B, "System Safety Program Requirements," March 30, 1984

American National Standards Institute (ANSI) Standards S1.11-1986, "Specifications for Octave-Band and Fractional Octave-Band Analog and Digital Filters," July 16, 1986

American National Standards Institute (ANSI) Standards S3.6-1989, "Specifications for Audiometers," May 23, 1989

Title 29, Code of Federal Regulations (CFR), Section 1910.95, "Occupational Noise Exposure," current edition

DEFINITIONS

1. Decibel A-weighted (dBA). The standard abbreviation for sound levels measured with an instrument set to the A-weighting network. The A-weighting network reduces the contribution of lower frequencies, which are of less concern for hearing conservation.

2. Decibel (dB). A unit of measurement of sound pressure level. The sound pressure level, in dB, is equal to 20 times the common logarithm of the ratio of the existing sound pressure to a reference sound pressure of 20 micropascals.

3. Decibel Peak (dBp). Standard abbreviation for peak sound level equal to 20 times the common logarithm of the ratio of the highest instantaneous sound pressure to a reference pressure of 20 micropascals. Used in the measurement of impulse noise.

4. Hazardous Noise. Exposure to steady state noise equivalent to 85 dBA for 8 hours. Components may define time-intensity trading rates as appropriate for their rest cycle conditions using subsection A.1. of enclosure 3. Exposure to impulse noise levels greater than 140 dBp.

5. Hazardous Noise Area. Any work area where workers are likely to receive a daily total noise dose in excess of that calculated using subsection B., enclosure 3, or where impulse noise levels exceed 140 dBp. For personnel exposed to appreciable noise levels for periods of 24 hours or more, a daily dose of 100 percent can occur at continuous noise levels as low as 79 dBA.

6. Hertz (Hz). A unit of measure of frequency, numerically equal to cycles per second.

7. Impulse Noise. A short burst of an acoustic energy consisting of either a single impulse or a series of impulses. The pressure-time history of a single impulse includes a rapid rise to a peak pressure, followed by a somewhat slower decay of the pressure envelope to ambient pressure, both occurring within 1

second. When the intervals between impulses are less than 500 milliseconds, the noise is considered continuous, excepting short bursts of automatic weapons fire, which are considered impulse noise.

8. Presbycusis. Hearing loss due to age.

9. Reference Audiogram. An audiogram free from auditory fatigue and other transient otologic pathology, against which future audiograms are compared.

10. Significant Threshold Shift (STS). The STS is the same as the OSHA standard threshold shift. A STS is present when there is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 Hz in either ear.

SAMPLE NOISE EXPOSURE COMPUTATION

A. When using a 4 dB power doubling rate, noise dose may be computed from sound pressure level measurements as follows:

1. When the sound level is constant over the entire workshift, the noise dose, D, in percent, is given by:

$$D = 100 C/T$$

where C is the total length of the workday, in hours, and T is the reference duration corresponding to the measured sound level, L, as computed by the equation:

$$T = 16 / (2 \exp((L-81)/4))$$

2. When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the workday is given by:

$$D = 100(C_1/T_1 + C_2/T_2 \dots C_n/T_n)$$

where C_n indicates the total time of exposure at a specific noise level, and T_n indicates the reference duration for that level as given by the equation:

$$T_n = 16 / (2 \exp((L-81)/4))$$

B. The TWA may be computed from noise dosimeter readings as follows. The noise dosimeter should be capable of integrating all noise levels from 80-130 dBA and using a 5 dB time-intensity integration factor

or Component exchange rate:

$$\text{TWA} = 85 + Q \log (D/100)$$

where TWA is the 8-hour time-weighted average sound level; Q is a constant equal to R/log 2; R is the exchange rate per doubling time (not more than 5 dB); and D is the accumulated dose in percent exposure.

C. When exposures to steady-state noise, including impulse noise below 130 dBP, occur simultaneously with or within the same 24-hour period as exposure to impulse noise above 130 dBP, the hazard criteria shall be applied to separately (i.e., the allowable exposure to steady-state noise shall not be reduced because of exposure to impulse noise).